

## HOW DOES CLUMP WORK?

CLUMP uses a new classification system designed for monitoring that records the land activity and the land cover of an area. Land activity refers to the use to which a unit of land is put (e.g., agriculture, forestry, recreation, manufacturing). Land cover identifies the vegetation or artificial cover occupying a unit of land (e.g., trees, grass, bare surfaces, structures, water).

Information on land use change is classified according to the CLUMP land activity/cover system through the use of aerial photographs and LANDSAT (satellite) images, augmented by

field checks and other information sources. This information is typically mapped at the 1:50 000 or 1:250 000 scale and usually entered into a computerized map storage and retrieval system such as the Canada Land Data System (CLDS). By using data gathered at different time periods and analysed in this way, it is possible to evaluate the rate, extent, location and nature of land use changes, and to determine the kind of land resources that are being affected by these changes. By establishing the time period at 5 or 10 year intervals coincident with census years, the correlation of CLUMP information with other data sets is possible.

An element of flexibility has been incorporated into the program to allow for variation in the type and format of output possible from this analysis. The final data showing the amount of land use that has undergone change over a period of time on a number of scales can be produced in tabular, graphic, map and report formats.

## INTERPRETATION → FIELD VERIFICATION → LAND USE CHANGE FOR COMPUTER INPUT → COMPUTER OVERLAY OF LAND USE CHANGE AND OTHER DATA → CLUMP OUTPUTS

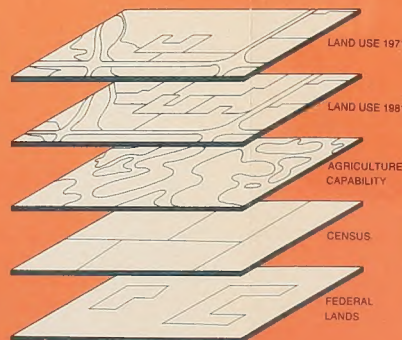
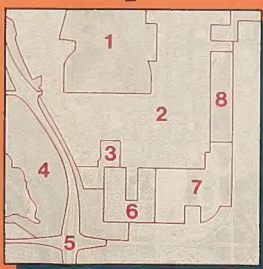


Calgary 1971



Calgary 1981

	LAND USE 1971	LAND USE 1981
1	ANNUAL TILLAGE CROPS, IDLE LAND	TO RECREATION
2	ANNUAL TILLAGE CROPS, GRAZING, IDLE LAND	TO MANUFACTURING
3	GRAZING, IDLE LAND	TO RECREATION
4	IDLE LAND	NO CHANGE
5	IDLE LAND RECREATION	TO TRANSPORTATION
6	RESIDENTIAL	NO CHANGE
7	IDLE LAND	TO LAND IN TRANSITION
8	ANNUAL TILLAGE CROPS, GRAZING	TO IDLE LAND



## USES OF CLUMP INFORMATION

Information and data accumulated by the program can be used to:

- provide national and regional overview information on land use changes for federal policy initiatives and program evaluation;
- identify major areas where land use change is occurring;
- analyze land use trends for use in national and regional economic development and environmental strategies;
- supply environmental land use data for agricultural, forestry, energy, recreational, and conservation planning purposes;
- make information available for educational and public interest needs.

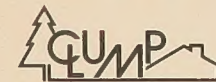
## FURTHER INFORMATION

Reports and other information on land use change are available from Lands Directorate staff located in Environmental Conservation Service offices in Dartmouth, Ste-Foy, Burlington, Regina and Vancouver or from:

Chief, Land Use Monitoring Division  
Lands Directorate  
Environment Canada  
Ottawa, Canada  
K1A 0E7  
(819) 997-2240

Air photographs for Hull, Québec, A30137-10 (1966), A31297-36 (1982), and Calgary, Alberta, A21623-4 (1970), A21984-5 (1982) reproduced from the collection of the National Air Photo Library with permission of Energy, Mines and Resources Canada.

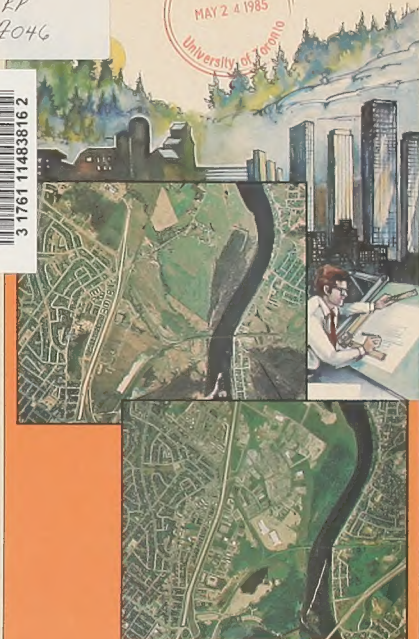
Satellite image of Winnipeg, Manitoba, courtesy of Canada Centre for Remote Sensing.



## CANADA LAND USE MONITORING PROGRAM

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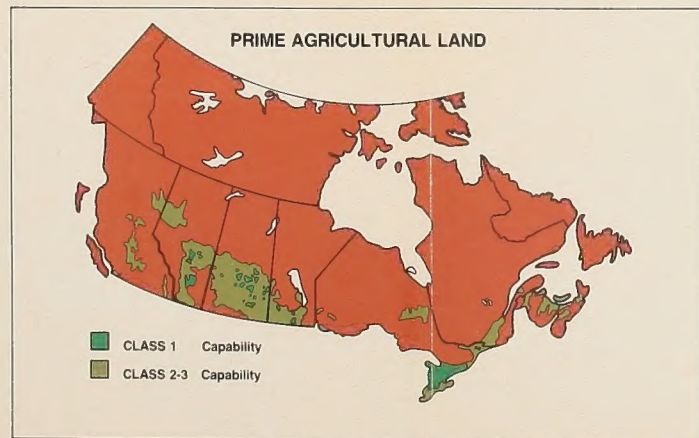


## LAND — THE VITAL RESOURCE

Land plays a vital role in the Canadian economy. Approximately 25% of the Gross Domestic Product and an estimated 65% of exports are dependent on agricultural, mineral, energy and forestry products derived from the land resource. In addition, the land resource provides wildlife habitats; supports recreational, cultural and scientific activities; and supplies sites for houses, manufacturing and industrial plants, energy production facilities, and transportation networks.

While Canada's total land area of 922 million ha seems abundant enough to support all activities, the allocation and use of land is often severely restricted by socio-economic factors and physical limitations such as climate, terrain and soil conditions. For instance:

- Of the 120 million ha of Canada's total land which is suitable for AGRICULTURE, only 3.4% or 4.1 million ha are considered to be of the highest productivity with a capacity to grow a wide range of crops, including corn, specialty fruits and vegetables.
- Between 1966 and 1976, the expansion of URBAN areas with populations over 25 000 resulted in the conversion of an estimated 150 000 ha of rural land to urban uses. Sixty percent of this land had a high capability rating for agriculture.
- Although 48% of Canada is covered by FOREST, only 24% (220 million ha) of the total land area is productive forest land. Forestry and related industries employ one million Canadians.



- The total land area disturbed and utilized by MINING activities is estimated at 285 900 ha. All aspects of mining in the next 20 years are likely to utilize or disturb another 300 000 ha.

Many of these changes in land use, such as urbanization, tend to be irreversible. Others, like deforestation, without restocking, and degradation of agricultural soils, severely reduce production.

## THE IMPORTANCE OF MONITORING LAND USE CHANGE

If Canada's land resource base is to continue to meet the demands for food and forestry production, housing, transportation, recreation, energy development, and industrial and urban growth, it is vital that a comprehensive understanding of the processes and implications of land use trends be obtained. To do this, answers are urgently needed to a number of important questions:

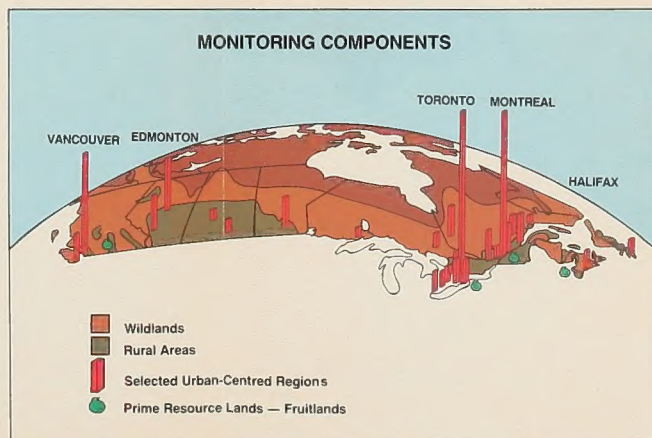
- Where is land use change occurring and at what rate?
- To what extent are the highest quality agricultural, forestry, mineral, energy and recreational lands allocated to their most productive uses?
- Are land use practices that sustain the land resource base being encouraged?
- How are government policies and programs, specifically those of the federal government, contributing to the patterns of land use across Canada?

## CANADA LAND USE MONITORING PROGRAM (CLUMP)

The Canada Land Use Monitoring Program was established in 1978 in recognition of the importance of land to Canada and the need to equip researchers, planners, land resource managers and policy makers with a more adequate land use change information base. The Program complements the land capability surveys of the Canada Land Inventory.

Designed to monitor, both spatially and sequentially, land use and land use change in various component areas of Canada, CLUMP:

- provides improved awareness of the state of the land resource;
- identifies land use trends of national and regional importance;
- determines major areas of rapid change which can potentially create land use problems;
- analyses land use change in terms of causes and consequences particularly with respect to the impact of government policies and programs;
- generates a more comprehensive data base for developing national resource strategies related to agriculture, forestry, energy and other sectors.



## THE COMPONENTS OF CLUMP

Four major components have been identified for monitoring the diverse forms of land use and land use change in Canada.

### URBAN-CENTRED REGIONS

This component examines land use in the rural-urban fringe of urban centres with populations of over 25 000.

These regions are characterized by:

- complex land use patterns;
- strong competition among different land use activities;
- rapid changes in land use as a result of economic development and population adjustments.

The Urban-Centred Region data permit:

- the description of the pattern, type and rate of land use change in urban-centred regions;
- the analysis of the loss of high capability agricultural and other resource lands to urbanization;
- the correlation of land use change and population growth.



### THE COMPONENTS OF CLUMP

### PRIME RESOURCE LANDS

This component focuses on those lands which make a special contribution to agriculture, forestry, wildlife preservation, recreation, mineral development, or energy activities.

Prime Resource Lands are characterized by:

- limited geographic, climatic, and land quality requirements;
- susceptibility to detrimental influences from incompatible activities on adjacent lands;
- location in areas which are under pressure to change land use.

Data on Prime Resource Lands can be used to assess:

- the distribution and amount of these unique lands;
- the effects of government policies and programs on these lands;
- the location, nature, rate and extent of change on and adjacent to these lands.



### RURAL AREAS

Rural Areas include traditional agricultural lands, wooded areas, idle lands, many mining and energy sites, recreational lands, as well as rural settlements.

Rural Areas present significant challenges to monitoring because of:

- the large, dispersed area of the country that is included;
- the diversity of land uses and land qualities;
- the need for cost-effective data-gathering methods.

The monitoring of rural land use change is important in assessing:

- the overall pattern, location and rate of land use change and the extent to which land is allocated to its best capability;
- the rate at which the interplay between agricultural land and forestry areas is shifting;
- the land use effects of energy and mineral activities on rural areas.



### WILDLANDS

This component includes the vast amount of land which lies beyond the continuously settled regions of Canada.

Wildlands are characterized by:

- lack of surface access;
- low biological productivity and/or a fragile environment in many areas;
- concentrated areas of development.

Land use monitoring can contribute to the assessment of:

- the effect on related ecosystems of energy developments and mineral extraction activities;
- the impacts of resource development on wildlife and environmental quality;
- the influence on the environment of water diversion schemes.